CAMBRIDGE
International Education

Specimen Paper Answers
Paper 2 Calculator

Cambridge IGCSE™/Cambridge O Level
Additional Mathematics 0606/4037

For examination from 2025

v1

Cambridge Pathway

Contents

Introduction

These specimen answers have been produced by Cambridge International ahead of the examination in 2025 to exemplify approaches to the questions for those teaching Cambridge IGCSE Additional Mathematics (0606). Questions have been selected from Specimen Paper 2, Questions 1, 4, 5, 6 and 7.

These are model answers. The working is accompanied by a brief commentary explaining alternative approaches or key considerations for the answers. Comments include more information about common misconceptions and key steps in working for students to be aware of.

The specimen materials are available to download from the School Support Hub at
www.cambridgeinternational.org/support

2025 Specimen Paper 02

2025 Specimen Paper Mark Scheme 02

Past exam resources and other teaching and learning resources are available on the School Support Hub
www.cambridgeinternational.org/support

Details of the assessment

The syllabus for Cambridge IGCSE Additional Mathematics 0606 is available at
www.cambridgeinternational.org

Assessment overview

All candidates take two components. Candidates will be eligible for grades A* to E.

Candidates should have a scientific calculator for Paper 2. Please see the *Cambridge Handbook* at **www.cambridgeinternational.org/eoguide** for guidance on use of calculators in the examinations Calculators are **not** allowed for Paper 1.

All candidates take:		**and:**	
Paper 1	2 hours	**Paper 2**	2 hours
Non-calculator	50%	Calculator	50%
80 marks		80 marks	
Structured and unstructured questions		Structured and unstructured questions	
Use of a calculator is **not** allowed		A scientific calculator is required	
Externally assessed		Externally assessed	

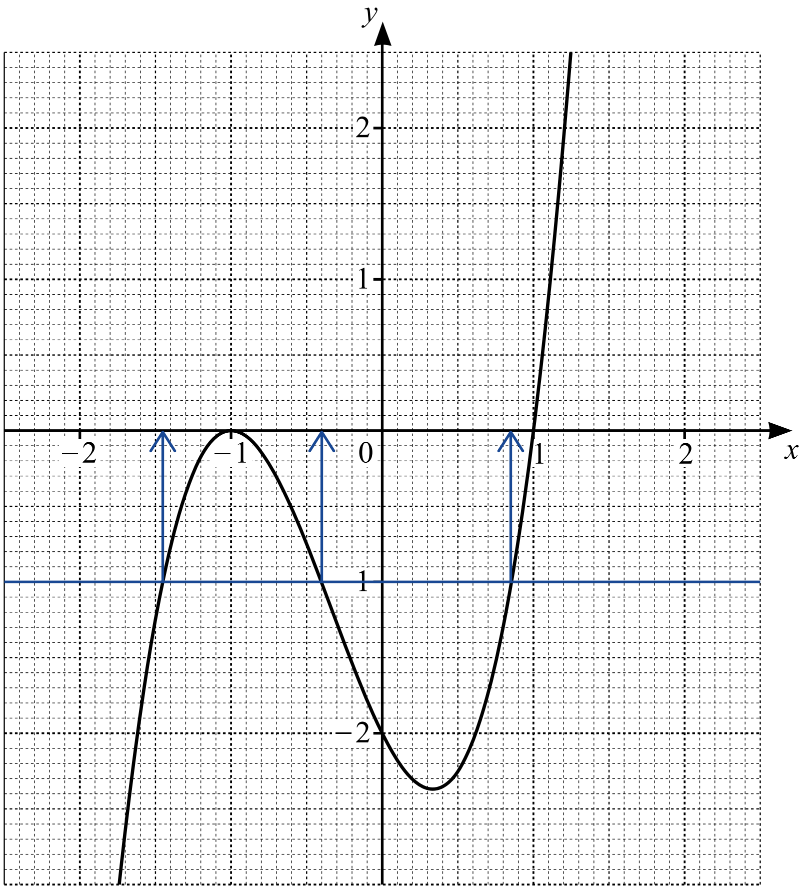
Question 1

Specimen answer

1 **(a)** Solve the equation $5|5x-7|-1=14$. [3]

$5|5x-7|=15$
$|5x-7|=3$
$5x-7=3$ or $5x-7=-3$
$5x=10$ or $5x=4$
$x=2$ or $x=\frac{4}{5}$

(b)



The diagram shows the graph of $y=f(x)$, where $f(x)=2(x+1)^2(x-1)$.

Use the graph to solve the inequality $f(x)\leqslant -1$. [3]

Critical Values: –1.45, –0.4, 0.85
$x\leqslant -1.45$, $-0.4\leqslant x\leqslant 0.85$

Examiner comment

(a) The response details a suitable strategy to solve this simple problem. A correct order of operations has been applied to the equation. A correct pair of linear equations has been formed and then solved. All the steps in the solution have been clearly stated and clear understanding of the modulus notation has been indicated. An alternative approach, which would have been equally valid, would have been to solve $(5x - 7)^2 = 3^2$ and this is detailed in the mark scheme.

(b) The instruction in the question is to use the graph to solve the inequality. The response shows good communication of the graph being used as required. The line $y = -1$ and arrows to help to read the x-coordinates of the points of intersection have all been drawn. This information has then been interpreted correctly and the three critical values written down before the correct inequalities have been formed.

Common errors and general guidance for candidates

- In questions such as part **(a)**, candidates occasionally attempt to change signs before they isolate the modulus expression. This is much more prone to error as candidates often forget to change the signs of all constants in this case.
- Also, in questions such as part **(a)**, candidates occasionally misinterpret the modulus notation and reject values for x that are negative or fractional and state only positive integer answers.
- The instruction in part **(b)** was to use the graph. Sometimes candidates ignore this and use an algebraic approach. In this case that would waste a significant amount of time and be more likely to result in an error.
- In questions such as part **(b)**, sometimes candidates use incorrect inequality signs in their answer. For example, $<$ may be used instead of $\leqslant$ or the answers may be the solution of $f(x) \geqslant -1$ instead of $f(x) \leqslant -1$. Rereading the question once they have finished their solution may help candidates avoid these errors.

Question 4

Specimen answer

4 A photographer takes 12 different photographs. There are 3 photographs of sunsets, 4 of oceans and 5 of mountains.

(a) The photographs are arranged in a line on a wall.

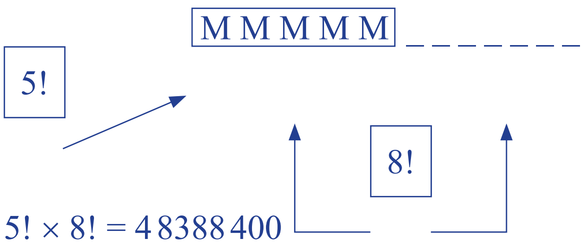
(i) Find the number of possible arrangements if the first photograph is of a sunset and the last photograph is of an ocean. [2]

3 S
4 O
5 M
12

S [_ _ _ _ _ _ _ _ _ _] O

$= 3 \times 10! \times 4$
$= 43\,545\,600$

(ii) Find the number of possible arrangements if all the photographs of mountains are next to each other. [2]



$5! \times 8! = 4\,8388\,400$

(b) Three of the photographs are selected for a competition.

(i) Find the number of different possible selections if no photograph of a sunset is chosen. [2]

No sunsets: ${}^{9}C_{3} = 84$

(ii) Find the number of different possible selections if one photograph of each type (sunset, ocean, mountain) is chosen. [2]

Select 1 from 3 and 1 from 4 and 1 from 5:
${}^{3}C_{1} \times {}^{4}C_{1} \times {}^{5}C_{1} = 60$

Examiner comment

Questions of this type need some interpretation. In all parts, the response has detailed the correct strategy to solve the problem before a calculator has been used to evaluate the answer. This is important as factorials and combinations needed to be evaluated.

(a) (i) The information from the question has been, carefully, recorded on the left-hand side of the solution. A simple diagram has been drawn to help with the interpretation of the problem. This diagram has then been translated into a calculation. A calculator has been used correctly to evaluate the answer and care taken to write down the digits correctly. Permutations could have been used as an alternative approach here and the method mark could have been earned, for example, for ${}^{3}P_{1} \times {}^{10}P_{10} \times {}^{4}P_{1}$.

(a) (ii) Again, a simple diagram has been drawn as a visual aid to interpret the problem. The number of ways of arranging the photographs of mountains, 5!, has been indicated. These photographs must now be treated as one object in the calculation and that has been communicated. The correct interpretation has resulted in the correct calculation, $5! \times 8!$, using the product rule for counting. Care has been taken, as was necessary with such large values, to record the correct answer from the calculator. Permutations could have been used as an alternative approach here and the method mark could have been earned, for example, for ${}^{5}P_{5} \times {}^{8}P_{8}$.

(b) (i) In this part of the question, some of the photographs are selected from the twelve and the order of selection is no longer important. This has been interpreted correctly and combinations used to answer the question. The most efficient method of solution is shown in the response. As 9 photographs were not of sunsets, 3 from 9 could be selected. An alternative, but less efficient method would be to consider all the possible cases that there could be without sunsets, by considering the specific cases that then would be possible. The method mark could have been earned, for example, for all Mountains or 1 Ocean and 2 Mountains or 2 Oceans and 1 Mountain or 3 Oceans:
${}^{4}C_{0} \times {}^{5}C_{3} + {}^{4}C_{1} \times {}^{5}C_{2} + {}^{4}C_{2} \times {}^{5}C_{1} + {}^{4}C_{3} \times {}^{5}C_{0}$.

(b) (ii) Again, the correct deduction that order is not relevant and combinations are appropriate here has been shown in this response. The logical thinking needed to solve the problem has been written own and then translated into correct mathematics. This has then been correctly evaluated using a calculator. As one photograph of each type was being selected here, it was possible, of course, to earn the method mark by simply writing down the calculation $3 \times 4 \times 5$, as there were 3, 4 and 5 ways to select each of the photographs.

Common errors and general guidance for candidates

- Candidates need to decide if order or position is important. If order or position matters, so items or people are arranged in some way, then permutations are appropriate. If order does not matter, so items or people are selected but not arranged or not given a position, for example, then combinations are appropriate.
- Diagrams are very useful to ensure correct thinking. However, candidates should be aware that writing, for example, $3\ {}^{10}P_{10}\ 4$ without any indication of multiplication is not sufficient for a method mark to be awarded should the final answer be incorrect.
- Candidates need to be aware that the basis for what they are doing is to use the 'product rule for counting' when applying these counting strategies. This should help them recall that when they are selecting '1 from 3 and 1 from 4 and 1 from 5', for example, they need to multiply and not add the values.
- When they have been asked to find the number of different possible selections, candidates should be aware that a value is expected for the answer. This means leaving the answer as ${}^{9}C_{3}$ would not be considered to be fully correct.

Question 5

Specimen answer

5 Given that $y = \tan x$, use calculus to find the approximate change in y as x increases from $-\frac{\pi}{4}$ to $h - \frac{\pi}{4}$, where h is small. [3]

$\frac{\mathrm{d}y}{\mathrm{d}x} \sec^2 x$ When $x = -\frac{\pi}{4}$ $\delta x = h$ $\frac{\delta y}{h} \approx \left.\frac{\mathrm{d}y}{\mathrm{d}x}\right|_{x=-\frac{\pi}{4}}$

$$\delta y = \sec^2\left(-\frac{\pi}{4}\right) \times h = \frac{h}{\cos^2\left(-\frac{\pi}{4}\right)} = 2h$$

Examiner comment

All the components needed to answer the question have been detailed in the first line of the solution. The instruction to use calculus, a word which is expected to be understood, has been followed and a correct strategy has been stated. The first mark is awarded for the very first statement, the derivative of tan *x*, and the method mark is earned at the point where $\delta y = \sec^2\left(-\frac{\pi}{4}\right) \times h$ has been written down. The interpretation of this, rewriting the $\sec^2\left(-\frac{\pi}{4}\right) \times h$ as $\frac{h}{\cos^2\left(-\frac{\pi}{4}\right)}$ ready to evaluate using their calculator, has been stated correctly. The calculator has been set to radian mode, which is appropriate for the application of calculus to trigonometric functions, and the solution completed correctly.

Common errors and general guidance for candidates

- A common error in such questions is to have the calculator in the incorrect mode. Candidates may be able to avoid this if, where appropriate, they determined the mode needed and made sure their calculator was set correctly before they started the question.
- Sometimes, when answering questions about small increments and approximations, candidates omit the small increment, in this case h, from the final answer. This may be avoided by writing $\frac{\delta y}{h} \approx \left.\frac{\mathrm{d}y}{\mathrm{d}x}\right|_{x=-\frac{\pi}{4}}$ or similar as part of the solution, as then all parts of the solution are linked.
- Similarly, some candidates misread questions about small increments and approximations or seem to expect to always be finding an expression for δy. In fact, finding the approximate change in *x* or the approximate change in *y* are both expected in syllabus statement 14.7. Encouraging candidates to write a general statement such as $\frac{\delta y}{\delta x} \approx \left.\frac{\mathrm{d}y}{\mathrm{d}x}\right|_{x=\text{initial value}}$ and then replace δy or δx and the initial value of *x*, as appropriate, may help overcome this.

Question 6

Specimen answer

6 A curve has equation $y = \ln(5 - 3x)$ where $x < \frac{5}{3}$. The normal to the curve at the point where $x = -5$, cuts the x-axis, at the point P.

Find the equation of the normal and the x-coordinate of P. [7]

gradient of tangent $= \dfrac{-3}{5-3x}$

When $x = -5$, $m_t = \dfrac{-3}{5+15} = -0.15$

$m_n = \dfrac{-1}{-0.15} = \dfrac{20}{3}$

$y = \ln 20$

So $y - \ln 20 = \dfrac{20}{3}(x+5)$

When $y = 0$

$0 - \ln 20 = \dfrac{20}{3}(x+5)$

$-3\ln 20 = 20x + 100$

$x = \dfrac{-3\ln 20 - 100}{20}$

$x = -5.44935...$

$x = -5.45$ (to 3 sf)

Examiner comment

Even though the value of $\frac{dy}{dx}$ when $x = -5$ can be found using a function on many calculators, the first derivative must still be written down as part of the solution. The correct derivative has been stated in the first line of the response and has earned the first two marks. The derivative has then been evaluated accurately at the point $x = -5$ and the gradient of the tangent stated as an exact decimal. In the next line of working, the response shows the correct use of the gradient of the tangent to find the gradient of the normal and a method mark is earned for that step. The correct value of y when $x = -5$ has been found. The accuracy mark for the formation of the equation of the normal is earned as the gradient of the normal and the point

(–5, ln 20) have been used correctly to form an equation of the normal. Any correct form for this equation would be acceptable. The response is concluded with the final step in the solution, setting $y = 0$ and finding the x-coordinate of P as required.

Common errors and general guidance for candidates

- Even though the derivative must be written down for full and correct method to be shown, it is a good idea to **check** the accuracy of answers using a calculator where possible. This should allow candidates to correct numerical slips in their working. Checking with or without the calculator is always a good idea and may be even more important in questions where there are several negative values.
- On occasion, a question requires candidates to provide more than one part to an answer, as in this case. Sometimes candidates only find one part of the solution and omit to continue to complete their answer. This may be avoided if they are encouraged to always reread a question once they believe they have finished.
- Some candidates do not use any calculus when answering questions about equations of tangents and normals. Instead, they find the coordinates of two points, which may or may not be close together, and find the equation of the chord joining these points. This is an incorrect method and would not be credited.

Question 7

Specimen answer

7 **Solutions to this question by accurate drawing will not be accepted.**

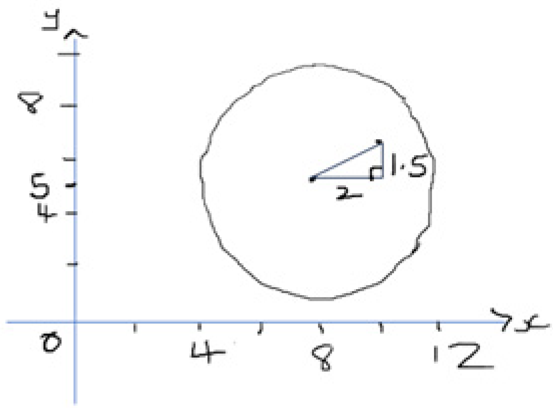
A circle has equation $x^2 + y^2 - 16x - 10y + 73 = 0$.

(a) **(i)** Find the coordinates of the centre of the circle and the length of the radius. [3]

Completing the square: $x^2 - 16x + y^2 - 10y + 73 = 0$
$(x-8)^2 - 64 + (y-5)^2 - 25 + 73 = 0$
$(x-8)^2 + (y-5)^2 = 16$
Centre (8, 5) radius 4

(ii) Hence show that the point (10, 6.5) lies inside the circle. [2]

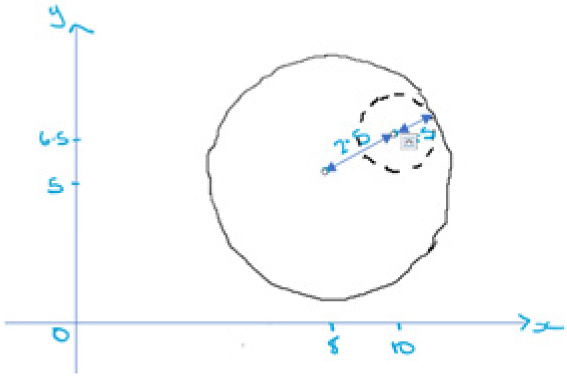
Centre (8, 5) radius 4
If point inside then distance from (10, 6.5) to the centre will be less than 4:



$\sqrt{2^2 + 1.5^2} = 2.5$
2.5 is less than 4 ✓

(b) A different circle has equation $(x - 10)^2 + (y - 6.5)^2 = 2.25$.

Show that the two circles touch. You are not required to find the coordinates of the common point. [1]



First circle: Centre (8, 5) radius 4
Second circle: Centre (10, 6.5) radius 1.5
4 – 1.5 = 2.5 and this is the distance between the centres, so they touch.

Examiner comment

(a) (i) The response shows the method of completing the square for *x* and *y*. The equation has been rearranged in the first line and the square completed in the second line. At this point the response earns the first mark. The correct equation has been given and interpreted. The coordinates of the centre and the length of the radius have been stated, as required.

This question could have been answered without completing the square, using knowledge of the equation $x^2 + y^2 + 2gx + 2fy + c = 0$ and making comparisons to find the centre and hence the radius. This approach is detailed in the mark scheme. The first mark using this approach is awarded for finding the centre by dividing each of the coefficients of the *x* and the *y* terms by –2. The next mark is given for the correct method for finding the length of the radius and the final mark for the correct evaluation of this calculation.

(a) (ii) The response follows the requirement of the instruction given and used the information found in the previous part of the question in order to answer this part. A full and detailed justification of why the point is within the circle has been offered, using a sketch to assist in the finding of the distance between the centre and the point.

(b) Again, a sketch is used to assist in determining the simplest method of solution. The question is worth 1 mark and so clearly there is no need to solve the equations of the circles simultaneously. This is indicated in the wording of the question, as the coordinates of the common point are not required. The calculation given, 4 – 1.5 = 2.5 is correct and sufficient for the mark.

Common errors and general guidance for candidates

- Common errors in the completing the square approach may be making sign errors and/or forgetting that the value given in the equation is that of r^2 not r. Reminding candidates that this form of the equation of the circle is given in the List of formulas on page 2 of the examination paper may help with these errors.
- The key terms ‘hence’ and ‘show that’ are important clues to candidates as they should direct them either to the simplest method of solution or a particular method that is specifically being assessed. Candidates who do not observe the key word ‘hence’ often produce solutions that are overly complicated or that are not credited as they do not use a required method. ‘Show that’ indicates that the marks are awarded for a fully-detailed method, with all steps stated or justified, as the answer or conclusion has already been given.
- Diagrams can help determine a sensible approach. A simple sketch would not be considered an accurate drawing. Even though a solution by accurate drawing alone is not acceptable, a diagram can be very helpful for candidates, as visualising the problem can help them to see how to find the answer.
- When answering questions such as part **(c)**, candidates should bear in mind the mark allocation for that question. A question worth 1 mark is not likely to require a multi-step algebraic solution.

For further information about common mistakes made by candidates, please refer to the examiner reports which are published after the first exam series in 2025 on the School Support Hub at **www.cambridgeinternational.org/support**

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